THE PLANT DISEASE REPORTER

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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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The relation of fruit disease incidence to weather cycles in the Hood River Valley of Oregon is discussed by J. R. Kienholz, page 77.

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A LIST OF NAMES AND SYNONYMS OF PHYTOPATHOGENIC BACTERIA OCCURRING IN THE UNITED STATES* EMBODYING RECENT CHANGES IN NOMENCLATURE

Freeman Weiss and Jessie I. Wood

In very recent years students of the phytopathogenic bacteria have given increasing attention to the relationship of these organisms to other bacteria as a whole. The segregation of special genera embracing only phytopathogenic forms as Erwinia and Phytomonas is giving way to consolidation of the various plant-infecting bacteria with presumably related forms in other genera based on morphological and physiological criteria, and Phytomonas (also because of invalidity as a generic name for bacteria) seems definitely on the way out. In line with this trend, several proposals involving changes in the names of familiar bacterial phytopathogens have recently been made. To many who have but lately been won to the nomenclature of Bergey's Manual this will appear like the confounding of confusion. The Plant Disease Survey formally adopted the Bergey Manual nomenclature only 3 years ago and has employed it to date in the current revision of the Check List of Plant Diseases of the United States.

Anticipating that recent proposals affecting the generic names of phytopathogenic bacteria will, because of the authoritative sources whence they emanate, receive wide acceptance among phytopathologists, it seems opportune at this time to compile a list of these organisms showing the evolution of the names that have been applied to them and, in accurate detail, the authorities responsible for these names. Without attempting to impose any standard or "authoritative" names but merely as a convenience to workers in this field, such a list has been prepared and will be used by the Plant Disease Survey as a standard in its files and indexes, pending the appearance of a new edition of Bergey's Manual. This list also will govern the choice of names used in the Plant Disease Reporter and Supplements but in all cases where authors employ other names, those of this list will be inserted in brackets. The preferred name is given first, followed by the synonyms in other systems of bacterial nomenclature. An index of specific names also is included so that the preferred generic name for any species may readily be found.

The present list includes those species of importance in American phytopathology that were listed under Phytomonas in the 5th edition (1939) of Bergey's Manual. For the present no change is made with respect to the genus Erwinia, although British phytopathologists now designate the species constituting the soft-rot group by the generic name Bacterium in the sense of Lehmann and Neumann. Because of the confused status of this name, it is employed here only for those species that have not been allocated to other genera, following the usage of Bergey's Manual, 5th ed., p. 590,

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* The inclusive range is more accurately "the United States and its possessions". A few organisms are included that do not occur in this range, but are listed here in order to give a complete treatment of nomenclatorial changes that affect them as well as organisms that do occur here.

where Bacterium is defined as comprising "species of non-spore-forming, rod-shaped bacteria whose position in the system of classification is not definitely established." The probable relationship of these species, hypothecated from the descriptions, is indicated in several instances, but the making of new combinations is expressly disclaimed.

Two species, listed in Bergey's Manual under Phytomonas, appear not to have been given any other generic name; these are P. lactucae-scariolae Thornberry & H. W. And., and P. ananas Serrano. The characteristics of the former relate it to Xanthomonas, and of the latter to Pseudomonas. All other combinations under Phytomonas are reduced to synonymy. In addition, 3 species allocated to this genus by Thornberry and H. W. Anderson (16) and one by Ayers et al (1), which are not listed in Bergey's Manual, are left for the present in this genus.

Dr. E. F. Burkholder of Cornell University, editor for phytopathogenic bacteria of the 5th edition, and prospective editor of the 6th edition, of the Bergey Manual, has kindly reviewed this list and indicated his approval of the designations of preferred names. We are greatly indebted to him for this courtesy, which in effect gives this list the only claim to authenticity and relative permanence that it possesses.

AGROBACTERIUM

Agrobacterium rhizogenes (Riker et al.) Conn (6)

Bacterium rhizogenes Riker et al.
Pseudomonas rhizogenes Riker et al.
Phytomonas rhizogenes Riker et al.

Agrobacterium tumefaciens (E.F.Sm. & Town.) Conn (6)

Bacterium tumefaciens E.F.Sm. & Town.
Pseudomonas tumefaciens (E.F.Sm. & Town.) Dug.
Bacillus tumefaciens (E.F.Sm. & Town) Israilsky
Polymonas tumefaciens (E.F.Sm. & Town.) Lieske
Phytomonas tumefaciens (E.F.Sm. & Town.) Bergey et al.

In erecting the genus Agrobacterium for the crown-gall and hairy-root phytopathogens, and the related soil organism listed in Bergey's Manual as Alcaligines (Bacillus, Bacterium, Rhizobium) radiobacter, it is to be noted that Conn (6) does not include the legume root-nodule organisms. These remain in Rhizobium.

BACTERIUM

Bacterium agropyri (O'Gara) Stapp (2)

Aplanobacter agropyri O'Gara
Phytomonas agropyri (O'Gara) Bergey et al.

BACTERIUM cont.

Bacterium albilineans Ashby (2)

Phytomonas albilineans (Ashby) Magrou

Bacterium alfalfae Riker, F. R. Jones & Davis (2)

Phytomonas alfalfae Riker, F. R. Jones & Davis
Pseudomonas alfalfae Riker, F. R. Jones & Davis
(? Probably Xanthomonas)

Bacterium beticolum E.F.Sm., N. A. Brown, & Town. (2)

Bacterium beticola (E.F.Sm., N. A. Brown, & Town.) Potebnia
Phytomonas beticola (E.F.Sm., N. A. Brown, & Town.) Bergey et al.
Pseudomonas beticola (E.F.Sm., N. A. Brown, & Town.) Stapp

Bacterium bowlesii (Lewis & Watson) Elliott (2)

Phytomonas bowlesii Lewis & Watson
(? Probably Pseudomonas)

Bacterium cannae Bryan (2)

Pseudomonas cannae (Bryan) Stapp
Phytomonas cannae (Bryan) Bergey et al.

Bacterium gypsophilae N. A. Brown (2, 14)

Pseudomonas gypsophilae (N. A. Brown) Stapp
Phytomonas gypsophilae (N. A. Brown) Magrou

Bacterium helianthi Kawamura var. tuberosi Thornberry & H. W. And. (16)

Phytomonas helianthi (Kawamura) Magrou var. tuberosi Thornberry & H. W. And.
(? Probably Pseudomonas)

Bacterium manihotis (Arthaud-Berthet) Drummond & Hipólito (4)
(Published as manihotus -- an orthographical error)

Bacillus manihotus Arthaud-Berthet ex Bondar
Bacillus manihoti Berthet & Bondar
Phytomonas manihotus (Arthaud-Berthet) Viégas

Bacterium panici Elliott (2)

Pseudomonas panici (Elliott) Stapp
Phytomonas panici (Elliott) Bergey et al.

BACTERIUM cont.

Bacterium pseudotsugae Hansen & R. E. Sm. (2, 14)

Phytomonas pseudotsugae (Hansen & R. E. Sm.) Burkh.

Bacterium rhizoctonia (Thomas) Stapp (2)

Aplanobacter rhizoctonia Thomas
Phytomonas rhizoctonia (Thomas) Burkh.
(? Probably Pseudomonas)

Bacterium rubi Hildebrand (10)

Phytomonas rubi Hildebrand
Pseudomonas rubi Hildebrand
According to Burkholder this species belongs in Agrobacterium, but this combination has not been made.

Bacterium rubrisubalbicans (Christopher & Edg.) Burgw. (2)

Phytomonas rubrisubalbicans Christopher & Edg.

Bacterium solanacearum E.F.Sm. (2)

Bacillus solanacearum E.F.Sm.
Pseudomonas solanacearum E.F.Sm.
Phytomonas solanacearum (E.F.Sm.) Bergey et al.
Phytomonas ricini Archibald
See Bergey (2) for other synonyms.
The var. asiaticum E.F.Sm. (Pseudomonas solanacearum var. asiatica (E.F.Sm.) Stapp, Phytomonas solanacearum var. asiatica (E.F.Sm.) Magrou) occurs in Sumatra.

Bacterium stewartii E.F.Sm. (2, 7, 14)
(Published as stewarti)

Pseudomonas stewarti E.F.Sm.
Aplanobacter stewarti (E.F.Sm.) McCul.
Phytomonas stewartii (E.F.Sm.) Bergey et al.
Xanthomonas stewarti (E.F.Sm.) Dowson

Bacterium stizolobii (Wolf) McCul. (2)

Aplanobacter stizolobii Wolf
Phytomonas stizolobii (Wolf) Bergey et al.
(? Probably Pseudomonas)

Bacterium tardicrescens McCul. (2, 14)

Phytomonas tardicrescens (McCul.) Burkh.

BACTERIUM cont.

Bacterium tomato Okabe (2)

Phytomonas tomato (Okabe) Magrou
Bacterium punctulans Bryan
(? Probably Pseudomonas)

Bacterium tonellianum Ferraris (2, 14)

Pseudomonas savastanoi var. nerii C. O. Sm.
Phytomonas tonelliana (Ferraris) Adam & Pugsley
Belongs in Pseudomonas according to Burkholder but this combination has not been published. For P. savastanoi var. fraxini see P. fraxini.

Bacterium vitians N. A. Brown (2)

Pseudomonas vitians (N. A. Brown) Stapp
Phytomonas vitians (N. A. Brown) Bergey et al.
(? Probably Xanthomonas)

CORYNEBACTERIUM

Corynebacterium fascians (Tilford) Dowson (8, 14)

Phytomonas fascians Tilford
Bacterium fascians (Tilford) Lacey

Corynebacterium flaccumfaciens (Hedges) Dowson (8, 14)

Bacterium flaccumfaciens Hedges
Pseudomonas flaccumfaciens (Hedges) Stapp
Phytomonas flaccumfaciens (Hedges) Bergey et al.

Corynebacterium insidiosum (McCul.) Jensen (2, 8, 14)

Aplanobacter insidiosum McCul.
Bacterium insidiosum (McCul.) Stapp
Phytomonas insidiosa (McCul.) Bergey et al.

Corynebacterium michiganense (E.F.Sm.) Jensen (2, 8, 14)

Bacterium michiganense E.F.Sm.
Aplanobacter michiganense E.F.Sm.
Pseudomonas michiganensis (E.F.Sm.) F. L. Stevens
Phytomonas michiganensis (E.F.Sm.) Bergey et al.

Corynebacterium poinsettiae Starr & Pirone (15)

Phytomonas poinsettiae Starr & Pirone

Phytomonas poinsettiae Starr & Pirone comb. nov.

The Corynebacterium combination is suggested but not published, . . . "when this genus is emended to include motile forms, this species might be included as Corynebacterium poinsettiae"

Corynebacterium rathayi (E.F.Sm.) Dowson (8)

Aplanobacter rathayi E.F.Sm.
Bacterium rathayi (E.F.Sm.) Stapp
Phytomonas rathayi (E.F.Sm.) Bergey et al.

Corynebacterium sepedonicum (Spieck. & Kotth.) Skapt. & Burkh. (8, 12)

Bacterium sepedonicum Spieck. nom. nud.
Bacterium sepedonicum Spieck. & Kotth.
Aplanobacter sepedonicum (Spieck.) E.F.Sm.
Phytomonas sepedonica (Spieck.) Magrou
Corynebacterium sepedonicum (Spieck.) Dowson

PHYTOMONAS

Phytomonas ananas Serrano (2)

(? Probably Pseudomonas. Not to be confused with Erwinia ananas Serrano)

Phytomonas columnae Thornberry & H. W. And. (16)

(? Probably Pseudomonas)

Phytomonas lactucae-scariolae Thornberry & H. W. And. (2)

(? Probably Xanthomonas)

Phytomonas lespedezae Ayers, Lefebvre, & H. W. Johns. (1)

(? Probably Xanthomonas)

Phytomonas plantaginis Thornberry & H. W. And. (16)

(? Probably Pseudomonas)

Phytomonas polygoni Thornberry & H. W. And. (16)

PSEUDOMONAS

Pseudomonas aceris (Ark) Starr & Burkh. (14)

Phytomonas aceris Ark

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* Phytomonas incanae Kendr. & Baker, California Agr. Exp. Sta. Bull. 665. 1942.

PSEUDOMONAS cont.

Pseudomonas alboprecipitans Rosen (2)

Phytomonas alboprecipitans (Rosen) Bergey et al.
Bacterium alboprecipitans (Rosen) Elliott

Pseudomonas aleuritidis (McCul. & Demaree) Stapp (2)

Bacterium aleuritidis McCul. & Demaree
Phytomonas aleuritidis (McCul. & Demaree) Magrou

Pseudomonas alliicola Burkh. (4, 14)

Phytomonas alliicola Burkh.

Pseudomonas andropogoni (E.F.Sm.) Stapp (2, 7, 14)

Bacterium andropogoni E.F.Sm.
Phytomonas andropogoni (E.F.Sm.) Bergey et al.

Pseudomonas angulata (Fromme & Murray) Stapp (2, 14)

Bacterium angulatum Fromme & Murray
Phytomonas angulata (Fromme & Murray) Bergey et al.
Listed by Dowson (7) as a synonym of P.tabaci

Pseudomonas aptata (N. A. Brown & Jamieson) Stapp (2, 7)

Bacterium aptatum N. A. Brown & Jamieson
Phytomonas aptata (N. A. Brown & Jamieson) Bergey et al.
Pseudomonas aptatum (N. A. Brown & Jamieson) in Dowson (7)

Pseudomonas atrofaciens (McCul.) Stapp (2, 7)

Bacterium atrofaciens McCul.
Phytomonas atrofaciens (McCul.) Bergey et al.

Pseudomonas berberidis (Thornberry & H. W. And.) Stapp (2, 14)

Phytomonas berberidis Thornberry & H. W. And.
Bacterium berberidis (Thornberry & H. W. And.) Burgw.

Pseudomonas caryophylli Burkh. (4, 14)

Phytomonas caryophylli Burkh.

Pseudomonas cichorii (D.B. Swingle) Stapp (2, 7, 14)

Phytomonas cichorii D. B. Swingle

Pseudomonas cichorii cont.

Bacterium cichorii (D. B. Swingle) Elliott
Pseudomonas endiviae Kotte
Phytomonas endiviae (Kotte) Clara
Bacterium formosanum Okabe
Pseudomonas formosanum (Okabe) in Dowson (7)

Pseudomonas coronafaciens (Elliott) Stapp (2, 14)

Bacterium coronafaciens Elliott
Phytomonas coronafaciens (Elliott) Bergey et al.
Bacillus avenae Manns
Pseudomonas avenae Manns
Phytomonas avenae (Manns) Bergey et al.

Pseudomonas coronafaciens var. atropurpurea (Reddy & Godkin) Stapp (2)

Bacterium coronafaciens var. atropurpureum Reddy & Godkin
Phytomonas coronafaciens var. atropurpurea (Reddy & Godkin) Magrou

Pseudomonas delphinii (E.F.Sm.) Stapp (2, 7, 14)

Bacillus delphinii E.F.Sm.
Bacterium delphinii (E.F.Sm.) Bryan
Phytomonas delphinii (E.F.Sm.) Bergey et al.
Pseudomonas delphini (Smith) in Dowson (7)

Pseudomonas erodii Lewis (2)

Bacterium erodii Lewis
Phytomonas erodii (Lewis) Bergey et al.

Pseudomonas fraxini (N. A. Brown) Škor. (13)

Bacterium savastanoi var. fraxini N. A. Brown
Phytomonas savastanoi var. fraxini (N. A. Brown) Magrou
Bacterium fraxini (N. A. Brown) Škor.
Phytomonas fraxini (N. A. Brown) Škor.

Pseudomonas gardeniae Burkh. & Pirone (5)

Phytomonas gardeniae Burkh. & Pirone

Pseudomonas glycinea (Coerper) Stapp (2, 14)

Bacterium glycineum Coerper
Phytomonas glycinea (Coerper) Burkh.

Pseudomonas glycinea cont.

Bacterium sojae Wolf
Phytomonas sojae (Wolf) Burkh.
Pseudomonas sojae (Wolf) Stapp

Pseudomonas intybi (D. B. Swingle) Stapp (2)

Phytomonas intybi D. B. Swingle
Bacterium intybi (D. B. Swingle) Elliott

Pseudomonas jaggeri Stapp (2, 7)

Pseudomonas apii Jagger
Phytomonas apii (Jagger) Bergey et al.
Bacterium jaggeri (Stapp) Elliott
Phytomonas jaggeri (Stapp) Magrou

Pseudomonas lachrymans (E.F.Sm. & Bryan) Ferraris (2, 7, 14)

Bacterium lachrymans E.F.Sm. & Bryan
Phytomonas lachrymans (E.F.Sm. & Bryan) Bergey et al.
Pseudomonas lacrymans (E.F.Sm. & Bryan) in Dowson (7)

Pseudomonas lapsa (Ark) Starr & Burkh. (14)

Phytomonas lapsa Ark

Pseudomonas maculicola (McCul.) F. L. Stevens (2, 7, 14)

Bacterium maculicolum McCul.
Bacterium maculicola (McCul.) McCul.
Pseudomonas maculicolum (McCul.) F. L. Stevens
Phytomonas maculicola (McCul.) Bergey et al.
Bacterium maccullochianum Burgw.
Pseudomonas maculicola (McCul.) in Dowson (7)

Pseudomonas marginalis (N. A. Brown) Stapp (2, 7)

Bacterium marginale N. A. Brown
Phytomonas marginalis (N. A. Brown) Bergey et al.
Pseudomonas marginale (Brown) Stapp in Dowson (7)

Pseudomonas marginata (McCul.) Stapp (2, 14)

Bacterium marginatum McCul.
Phytomonas marginata (McCul.) Bergey et al.

Pseudomonas martyniae (Elliott) Stapp (2, 7)

Bacterium martyniae Elliott

Pseudomonas martyniae cont.

Phytomonas martyniae (Elliott) Bergey et al.

Pseudomonas medicaginis Sackett (2, 14)

Bacterium medicaginis (Sackett) Elliott
Phytomonas medicaginis (Sackett) Bergey et al.

Pseudomonas medicaginis var. phaseolicola (Burkh.) Stapp & Hutt (2, 7, 14)

Phytomonas medicaginis var. phaseolicola Burkh.
Bacterium medicaginis var. phaseolicola (Burkh.) Link & Hull
Bacterium puerariae Hedges
Phytomonas puerariae (Hedges) Bergey et al.

Pseudomonas mellea (J. Johns.) Stapp (2, 7)

Bacterium melleum J. Johns.
Phytomonas mellea (J. Johns.) Bergey et al.
Pseudomonas melleum (J. Johns.) in Dowson (7)

Pseudomonas melophthora Allen & Riker (2)

Bacterium melophthorum Allen & Riker
Phytomonas melophthora Allen & Riker

Pseudomonas mori (Boyer & F. Lambert) F. I. Stevens (2, 7)

Bacterium mori Boyer & F. Lambert
Bacterium mori Boyer & F. Lambert emend E.F.Sm.
Phytomonas mori (Boyer & F. Lambert) Bergey et al.

Pseudomonas populans Rose (2, 7)

Bacterium populans (Rose) Elliott
Phytomonas populans (Rose) Bergey et al.

Pseudomonas pisi Sackett (2, 7, 14)

Bacterium pisi (Sackett) E.F.Sm.
Phytomonas pisi (Sackett) Bergey et al.

Pseudomonas polycolor Clara (2, 14)

Phytomonas polycolor Clara
Bacterium polycolor (Clara) Burgw.
According to R. P. Elrod and Armin C. Braun (Science n. s. 94: 520-521. 1941) this organism is identical with Pseudomonas aeruginosa (Schroet.) Migula.

PSEUDOMONAS cont.

Pseudomonas primulae (Ark & Gardner) Starr & Burkh. (14)

Phytomonas primulae Ark & Gardner

Pseudomonas prunicola Wormald (2, 7)

Phytomonas cerasi var. prunicola (Wormald) Wilson
According to some authorities, this is a synonym of P. syringae. Listed by Dowson (7) as distinct.

Pseudomonas savastanoi (E.F.Sm.) F. L. Stevens (2, 7, 14)

Bacterium savastanoi E.F.Sm.
Phytomonas savastanoi (E.F.Sm.) Bergey et al.

Pseudomonas striafaciens (Elliott) Starr & Burkh. (14)

Bacterium striafaciens Elliott
Phytomonas striafaciens (Elliott) Bergey et al.

Pseudomonas syringae van Hall (2, 7, 14)

Bacterium syringae (van Hall) E.F.Sm.
Phytomonas syringae (van Hall) Bergey et al.
Pseudomonas cerasus Griffin
Bacterium cerasi (Griffin) Elliott
Phytomonas cerasi (Griffin) Bergey et al.
Bacterium citriputeale C. O. Sm.
Pseudomonas citriputealis (C. O. Sm.) Stapp
Phytomonas citriputealis (C. O. Sm.) Bergey et al.
Bacterium citrifaciens Lee
Pseudomonas citrifaciens (Lee) Stapp
Bacterium holci Kendr.
Pseudomonas holci Kendr.
Phytomonas holci (Kendr.) Bergey et al.
Bacterium matthiolae Briosi & Pav.
Phytomonas matthiolae (Briosi & Pav.) Bergey et al.
Bacterium trifoliorum F. R. Jones et al.
Phytomonas trifoliorum (F. R. Jones et al.) Burkh.
Pseudomonas trifoliorum (F. R. Jones et al.) Stapp
Phytomonas utiformica Clara
Bacterium vignae Gardner & Kendr.
Phytomonas vignae (Gardner & Kendr.) Bergey et al.
Phytomonas vignae var. leguminophila Burkh.
Bacterium viridifaciens Tisdale & Williamson
Pseudomonas viridifaciens Tisdale & Williamson
Phytomonas viridifaciens (Tisdale & Williamson) Bergey et al.
Dowson (7) lists P. cerasi as distinct, with synonyms P. trifoliorum and P. holci. See also P. prunicola.

PSEUDOMONAS cont.

Pseudomonas tabaci (Wolf & Foster) Stapp (2, 7, 14)

Bacterium tabacum Wolf & Foster
Phytomonas tabaci (Wolf & Foster) Bergey et al.
Pseudomonas tabacum (Wolf & Foster) in Dowson (7)
Dowson (7) gives P. angulata as a synonym.

Pseudomonas tolaasi Paine (2, 7)

Phytomonas tolaasi (Paine) Bergey et al.
Bacterium tolaasi (Paine) Elliott

Pseudomonas viburni (Thornberry & H. W. And.) Stapp (2, 14)

Phytomonas viburni Thornberry & H. W. And.
Bacterium viburni (Thornberry & H. W. And.) Burgw.

Pseudomonas viridiflava (Burkh.) Clara (2, 7, 14)

Phytomonas viridiflava Burkh.
Bacterium viridiflava (Burkh.) Burgw.

Pseudomonas viridilivida (N. A. Brown) Stapp (2, 14)

Bacterium viridilividum N. A. Brown
Phytomonas viridilivida (N. A. Brown) Bergey et al.

Pseudomonas woodsii (E.F.Sm.) Stapp (2, 14)

Bacterium woodsii E.F.Sm.
Phytomonas woodsii (E.F.Sm.) Bergey et al.

XANTHOMONAS

Xanthomonas barbareae Burkh. (3, 14)

Phytomonas barbareae Burkh.

Xanthomonas begoniae (Buchw.) Dowson (7)

Bacterium begoniae Buchw., 1933
Bacterium begoniae Takimoto, 1934
Phytomonas flava begoniae Wieringa, 1935
Pseudomonas begoniae (Buchw.) Stapp, 1938
Pseudomonas begoniae (Buchw.) Pape emend Dowson, 1938
Phytomonas begoniae (Takimoto) Burkh., 1939

The begonia disease caused by this organism was described, and the pathogen was identified and named, but incompletely described, by Buchwald in 1933. A similar and

Xanthomonas begoniae cont.

Phytomonas begoniae cont.
probably identical disease was reported and the organism formally described by Takimoto in 1934, but the description was published only in Japanese. Pending a decision whether descriptions so published are valid, and since Dowson and Stapp have both credited Buchwald with the original description, the latter is here cited as the primary author of this species. See also Xanthomonas flavozonata.

Xanthomonas campestris (Pam.) Dowson (7, 14)

Bacillus campestris Pam.
Bacterium campestre (Pam.) E.F.Sm.
Pseudomonas campestris (Pam.) E.F.Sm.
Phytomonas campestris (Pam.) Bergey et al.
Xanthomonas campestre (Pam.) in Dowson (7)

Xanthomonas campestris var. armoraciae (McCul.) Starr & Burkh. (14)

Bacterium campestre var. armoraciae McCul.
Phytomonas campestris var. armoraciae (McCul.) Bergey et al.

Xanthomonas carotae (Kendr.) Dowson (7)

Pseudomonas carotae Kendr.
Phytomonas carotae Kendr.

Xanthomonas citri (Hasse) Dowson (7, 14)

Pseudomonas citri Hasse
Bacterium citri (Hasse) Doidge
Phytomonas citri (Hasse) Bergey et al.

Xanthomonas corylina P. W. Miller et al. (11, 14)

Phytomonas corylina P. W. Miller et al.

Xanthomonas cucurbitae (Bryan) Dowson (7, 14)

Bacterium cucurbitae Bryan
Phytomonas cucurbitae (Bryan) Bergey et al.

Xanthomonas flavozonata (McCul.) Dowson (7, 14)

Bacterium flavozonatum McCul.
? Phytomonas flava begoniae Wieringa

Xanthomonas flavozonata cont.

Xanthomonas flavozonatum (McCul.) Dowson
Considered a synonym of X. begoniae by Ark & Tompkins, Stapp, Pape, and Burkholder, and as apparently distinct by McCulloch and by Dowson.

Xanthomonas geranii (Burkh.) Dowson (7, 14)

Phytomonas geranii Burkh.

Xanthomonas gummisudans (McCul.) Starr & Burkh. (14)

Bacterium gummisudans McCul.
Phytomonas gummisudans (McCul.) Bergey et al.
Pseudomonas gummisudans (McCul.) Stapp

Xanthomonas hederae (Arnaud) Dowson (7, 14)

Bacterium hederae Arnaud
Phytomonas hederae (Arnaud) Burkh. & Guterman

Xanthomonas holcicola (Elliott) Starr & Burkh. (14)

Bacterium holcicola Elliott
Pseudomonas holcicola (Elliott) Stapp
Phytomonas holcicola (Elliott) Bergey et al.

Xanthomonas hyacinthi (Wakker) Dowson (7, 14)

Bacterium hyacinthi Wakker
Bacillus hyacinthi (Wakker) Trevisan
Pseudomonas hyacinthi (Wakker) E.F.Sm.
Phytomonas hyacinthi (Wakker) Bergey et al.

Xanthomonas juglandis (Pierce) Dowson (7, 14)

Pseudomonas juglandis Pierce
Bacterium juglandis (Pierce) E.F.Sm.
Phytomonas juglandis (Pierce) Bergey et al.

Xanthomonas malvacearum (E.F.Sm.) Dowson (7, 14)

Pseudomonas malvacearum E.F.Sm.
Bacterium malvacearum E.F.Sm.
Phytomonas malvacearum (E.F.Sm.) Bergey et al.

Xanthomonas papaericola (Bryan & McWhorter) Dowson (7, 14)

Bacterium papaericola Bryan & McWhorter
Phytomonas papaericola (Bryan & McWhorter) Bergey et al.

Xanthomonas pelargonii (N. A. Brown) Starr & Burkh. (14)

Bacterium pelargonii N.A. Brown
Pseudomonas pelargonii (N.A.Brown) Stapp
Phytomonas pelargonii (N.A.Brown) Bergey et al.

Xanthomonas phaseoli (E.F.Sm.) Dowson (7, 14)

Bacillus phaseoli E.F.Sm.
Pseudomonas phaseoli E.F.Sm.
Bacterium phaseoli E.F.Sm.
Phytomonas phaseoli (E.F.Sm.) Bergey et al.

Xanthomonas phaseoli var. sojense (Hedges) Starr & Burkh. (14)

Bacterium phaseoli var. sojense Hedges
Phytomonas phaseoli var. sojense (Hedges) Burkh.
Pseudomonas glycines Nakano
Bacterium glycines (Nakano) Elliott
Phytomonas glycines (Nakano) Magrou

Xanthomonas pruni (E.F.Sm.) Dowson (7, 14)

Pseudomonas pruni E.F.Sm.
Bacterium pruni E.F.Sm.
Phytomonas pruni (E.F.Sm.) Bergey et al.

Xanthomonas ricinicola (Elliott) Dowson (7, 14)

Bacterium ricinicola Elliott, 1930
Bacterium ricini Yoshi & Takimoto, 1928
Phytomonas ricinicola (Elliott) Burkh.

Xanthomonas rubrilineans (Lee et al.) Starr & Burkh. (14)

Phytomonas rubrilineans Lee et al.
Pseudomonas rubrilineans (Lee et al.) Stapp
Bacterium rubrilineans (Lee et al.) Elliott

Xanthomonas translucens (L.R.Jones, A.G.Johns. & Reddy) Dowson emend. Hagb., including the following formae speciales (7, 9, 14)

1. X. translucens f. sp. hordei Hagb.

2. X. translucens f. sp. undulosa (E.F.Sm., L.R.Jones, & Reddy) Hagb.

3. X. translucens f. sp. secalis (Reddy, Godkin, & A.G.Johns.) Hagb.

4. X. translucens f. sp. hordei-avenae Hagb.

Xanthomonas translucens cont.

5. X. translucens f. sp. cerealis Hagb.

(1) is the cause of bacterial blight of barley, (2) occurs on wheat (black chaff) and rye, (3) occurs on rye, (4) on Hordeum spp., (5) on Triticum spp. For synonymy see following:

Xanthomonas translucens f. sp. cerealis Hagb. (9)

Xanthomonas translucens f. sp. hordei Hagb. (9)

Bacterium translucens L.R.Jones, A.G.Johns., & Reddy
Pseudomonas translucens (L.R.Jones, A.G.Johns., & Reddy) Stapp
Phytomonas translucens (L.R.Jones, A.G.Johns., & Reddy) Bergey et al.
Xanthomonas translucens (L.R.Jones, A.G.Johns., & Reddy) Dowson

Xanthomonas translucens f. sp. hordei-avenae Hagb. (9)

Xanthomonas translucens f. sp. secalis (Reddy, Godkin, & A.G.Johns.) Hagb. (9)

Bacterium translucens var. secalis Reddy, Godkin & A.G.Johns.
Pseudomonas translucens var. secalis (Reddy, Godkin, & A.G. Johns.) Stapp
Phytomonas translucens var. secalis (Reddy, Godkin, & A.G. Johns.) Bergey et al.

Xanthomonas translucens f. sp. undulosa (E.F.Sm., L.R.Jones, & Reddy) Hagb. (9)

Bacterium translucens var. undulosum E.F.Sm., L.R.Jones, & Reddy
Pseudomonas translucens var. undulosa (E.F.Sm., L.R.Jones, & Reddy) Stapp
Phytomonas translucens var. undulosa (E.F.Sm., L.R.Jones, & Reddy) Hagb.

Xanthomonas vasculorum (Cobb) Dowson (7, 14)

Bacillus vascularum Cobb
Bacterium vascularum (Cobb) Migula
Pseudomonas vascularum (Cobb) E.F.Sm.
Phytomonas vasculorum (Cobb) Bergey et al.
Xanthomonas vasculorum (Cobb) Dowson
(Correct spelling of the suffix of the specific name appears to require o instead of a)

Xanthomonas vesicatoria (Doidge) Dowson (7, 14)

Bacterium vesicatorium Doidge
Pseudomonas vesicatoria (Doidge) Stapp
Phytomonas vesicatoria (Doidge) Bergey et al.
Pseudomonas exitiosa Gardner & Kendr.
Bacterium exitiosum Gardner & Kendr.
Phytomonas exitiosa (Gardner & Kendr.) Bergey et al.
Xanthomonas vesicatorium (Doidge) Dowson

Xanthomonas vesicatoria var. raphani (White) Starr & Burkh. (14)

Bacterium vesicatorium var. raphani White
Phytomonas vesicatoria var. raphani (White) Burkh.

INDEX OF SPECIFIC NAMES

aceris, Pseudomonas
agropyri, Bacterium
albilineans, Bacterium
alboracipitans, Pseudomonas
aleuritidis, Pseudomonas
alfalfae, Bacterium
alliicola, Pseudomonas
amans, Phytomonas
andropogoni, Pseudomonas
angulata, Pseudomonas
(apii, Phytomonas, Pseudomonas) = Pseudomonas jaggeri
aptata, Pseudomonas
atrofaciens, Pseudomonas
(avenae, Bacillus, Phytomonas, Pseudomonas) = Pseudomonas coronafaciens
barbareae, Xanthomonas
begoniae, Xanthomonas
berberidis, Pseudomonas
beticolum, Bacterium
bowlesii, Bacterium
campestris, Xanthomonas
campestris var. armoraciae, Xanthomonas
cannae, Bacterium
carotae, Xanthomonas
caryophylli, Pseudomonas
(carpici, cerasus, Bacterium, Phytomonas, Pseudomonas) = Pseudomonas syringae
(cerasi var. prunicola) = Pseudomonas prunicola
cichorii, Pseudomonas
(citrofaciens, Bacterium, Pseudomonas) = Pseudomonas syringae
citri, Xanthomonas

Index of Specific Names cont.

(citriputeale, citriputealis, Bacterium, Phytomonas, Pseudomonas) = Pseudomonas syringae
colurnae, Phytomonas
coronafaciens, Pseudomonas
coronafaciens var. atropurpurea, Pseudomonas
corylina, Xanthomonas
cucurbitae, Xanthomonas
delphinii, Pseudomonas
(endiviae, Phytomonas, Pseudomonas) = Pseudomonas cichorii
erodii, Pseudomonas
(exitiosa, exitiosum, Bacterium, Phytomonas, Pseudomonas) = Xanthomonas vesicatoria
fasciens, Corynebacterium
flaccumfaciens, Corynebacterium
(flava begoniae, Phytomonas) = Xanthomonas begoniae
flavozonata, Xanthomonas. Possibly a synonym of Xanthomonas begoniae
(formosanum, Bacterium, Pseudomonas) = Pseudomonas cichorii
fraxini, Pseudomonas
gardeniae, Pseudomonas
garnii, Xanthomonas
glycinea, Pseudomonas
(glycines, Bacterium, Phytomonas, Pseudomonas) = Xanthomonas phaseoli var. sojense
gummisudans, Xanthomonas
gypsophilae, Bacterium
hederae, Xanthomonas
helianthi var. tuberosi, Bacterium
(holci, Bacterium, Phytomonas, Pseudomonas) = Pseudomonas syringae
holcicola, Xanthomonas
hyacinthi, Xanthomonas
incanae, Phytomonas
insidiosum, Corynebacterium
intybi, Pseudomonas
jaggeri, Pseudomonas
juglandis, Xanthomonas
lachrymans, Pseudomonas
lactucae-scariolae, Phytomonas
lapsa, Pseudomonas
lespedezae, Phytomonas
(maccullochianum, Bacterium) = Pseudomonas maculicola
maculicola, Pseudomonas
malvacearum, Xanthomonas
manihotis, Bacterium
marginalis, Pseudomonas
marginata, Pseudomonas
martyniae, Pseudomonas
(matthiolae, Bacterium, Phytomonas) = Pseudomonas syringae
medicaginis, Pseudomonas

Index of Specific Names cont.

medicaginis var. phaseolicola, Pseudomonas
mellea, Pseudomonas
melophthora, Pseudomonas
michiganense, Corynebacterium
morii, Pseudomonas
panici, Bacterium
papavericola, Xanthomonas
papulans, Pseudomonas
pelargonii, Xanthomonas
phaseoli, Xanthomonas
phaseoli var. sojense, Xanthomonas
pisi, Pseudomonas
plantaginis, Phytomonas
poinsettiae, Corynebacterium
polycolor, Pseudomonas
polygoni, Phytomonas
primulae, Pseudomonas
pruni, Xanthomonas
pruinicola, Pseudomonas. Possibly a synonym of Pseudomonas syringae
pseudotsugae, Bacterium
(pueraricae, Bacterium, Phytomonas) = Pseudomonas medicaginis var. phaseolicola
(punctulans, Bacterium) = Bacterium tomato
rathayi, Corynebacterium
rhizoctoniae, Bacterium
rhizogenes, Agrobacterium
(ricini, Bacterium) = Xanthomonas ricinicola
(ricini, Phytomonas) = Bacterium solanacearum
ricinicola, Xanthomonas
rubi, Bacterium
rubrilineans, Xanthomonas
rubrisubalbicans, Bacterium
savastanoi, Pseudomonas
(savastanoi var. fraxini) = Pseudomonas fraxini
(savastanoi var. nerii) = Bacterium tonellianum
sepedonicum, Corynebacterium
(sojae, Bacterium, Phytomonas, Pseudomonas) = Pseudomonas glycinea
solanacearum, Bacterium
solanacearum var. asiaticum, Bacterium
stewartii, Bacterium
stizolobii, Bacterium
striafaciens, Pseudomonas
syringae, Pseudomonas
tabaci, Pseudomonas
(tabacum, Bacterium, Pseudomonas) = Pseudomonas tabaci
tardicrescens, Bacterium
telangi, Pseudomonas
tomato, Bacterium

Index of Specific Names cont.

tornelliianum, Bacterium
translucens, Xanthomonas
translucens f. sp. cerealis, Xanthomonas
translucens f. sp. hordei, Xanthomonas
translucens f. sp. hordei-avenae, Xanthomonas
translucens f. sp. secalis, Xanthomonas
translucens f. sp. undulosa, Xanthomonas
(trifolicrum, Bacterium, Phytomonas, Pseudomonas) = Pseudomonas syringae
tumefaciens, Agrobacterium
(utiformica, Phytomonas) = Pseudomonas syringae
vasculorum, Xanthomonas
vesicatoria, Xanthomonas
vesicatoria var. raphani, Xanthomonas
viburni, Pseudomonas
(vignae, Bacterium, Phytomonas) = Pseudomonas syringae
(vignae var. leguminophila, Phytomonas) = Pseudomonas syringae
(viridificiens, Bacterium, Phytomonas, Pseudomonas) = Pseudomonas syringae
viridiflava, Pseudomonas
viridilivida, Pseudomonas
vitians, Bacterium
woodsii, Pseudomonas

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(Abst. Rev. Appl. Mycol. 18: 560. 1939)

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(DIVISION OF MYCOLOGY AND DISEASE SURVEY).

SOME DISEASES OF GUAYULE IN CALIFORNIA

W. A. Campbell, L. D. Leach, J. T. Presley, and M. C. Snyder

It has become apparent in connection with the present extensive culture of guayule, Parthenium argentatum Gray, now under way in California for the production of rubber, that this plant is subject to a number of diseases. Hitherto guayule had been considered to be uniquely free of such troubles. A rust of minor importance, caused by Puccinia parthenii (Seym.) Arthur, and strangulation by dodder, Cuscuta sp., have been mentioned earlier by Lloyd[1/]. More recently guayule has been listed as a host of Phytotrichum omnivorum (Shear) Dug.[2/] However, other than these very brief notations there is practically no published information available on the diseases of this plant. It should be noted also that Smith[3/] has reported that guayule planted in California "is rather susceptible to excess soil moisture and often succumbs to a rotting of the roots when the soil becomes too wet."

During the summer of 1942 diseases of several types appeared in both nursery and field plantings of guayule in the Salinas area, and in experimental plantings in various parts of the State. In view of the situation the writers undertook a survey to determine the nature of the diseases of guayule as grown under California conditions and something of their potentialities. Samples of specimens were collected and cultured from several points in the State over a 3-month period (June, July, and August). Since laboratory facilities and equipment were not available at that time at the site of the guayule project headquarters at Salinas, the culturing and diagnosing of diseased specimens was undertaken at the University of California, and at the United States Field Station, Sacaton, Arizona.

Inoculation though the knowledge may yet be of the diseases of guayule in California gained in this survey, it is felt that the present information is of sufficient interest under the existing circumstances that it should be made available to those in other areas who also may be concerned with the culture of this plant as well as to all growers of the crop in California. Especially does it seem important that those being supplied with seedlings grown in California nurseries be informed of the nature of the nursery diseases here, for some of these undoubtedly have been carried into field plantings by way of infected seedlings.

In order to understand the conditions under which the diseases of this desert plant developed when put under intensive cultivation it is necessary to know something about the method of culture being employed. Seed had been sown in the nurseries from the last of March to June. Overhead sprinklers were used to keep the soil almost continuously wet especially

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1/ Lloyd, F. E. Guayule (Parthenium argentatum Gray). A rubber-plant of the Chihuahuan desert. Carnegie Institution of Washington. Publ. no. 139. 213 pp. illus. 1911.

2/ Ezekiel, W. N. and J. J. Taubenhaus. Hosts. Texas Agr. Exp. Sta. Ann. Rpt. 44: 60. 1931.

3/ Smith, Ralph E. Diseases of field crops. California Agr. Exp. Sta. Circ. 121, 79 pp., 1941.

during the early seedling stage. Frequent use of the overhead sprinklers was made throughout the summer to force maximum growth of the plants while they were still in the nursery. By late summer the plants had become crowded in the rows yet the forced growth had left them in a relatively tender condition. From October on the plants were dug and set out in field plantings where the shrub will remain for 2 growing seasons, mostly with irrigation, until harvested.

The previously recorded diseases of guayule, referred to above, have not been seen as yet in California. The diseases that have been observed, and found in several instances to be of some importance are root rot, wilt, collar rot, and top rot. Foliage troubles and injury due to nematodes have been less common.

Root rot. -- One of the most common and perhaps the most important of the root rots of guayule encountered so far is one characterized by black, sunken cankers on the tap root, laterals, crown and even on above-ground branches. Eventually they may girdle the affected part. Lesions of this black root rot tend to have a firm consistency and soon involve the stele as well as the cortex. The portion below the girdling canker may rot away, and the foliage wilts because of an impaired root system and the plant dies. From this root rot there has been cultured consistently a species of Phytophthora. The regularity with which this fungus has been isolated from plants showing black root rot and its apparent relationship to wet soil spots of poor drainage, leave little doubt that it is the causal agent. The disease is of frequent occurrence in the nurseries at Salinas, and in experimental field plantings both in the interior valley and along the coast. It would seem quite likely that the appearance of this destructive disease in at least some field plantings has been the result of setting out seedlings that had been infected while in the nursery.

Another root rot found in the nursery affects the lower portion of the tap root. Here a soft rot develops without any particular discoloration of the decayed cortical tissue. The stele laid bare by this root rot, however, often shows a pinkish color. Pythium sp. was commonly isolated from this type of root rot.

A third type of root rot consisted of corroded, brown or reddish-brown areas on the roots and sometimes crown. Cultures of these areas usually yield Rhizoctonia of the R. solani Kühn type.

Sclerotium bataticola Taub. and species of Fusarium were occasionally recovered from diseased roots showing nondescript root rot symptoms, but usually they accompanied one or the other of the above organisms and appeared to play largely a secondary role.

Wilt. -- Symptoms of wilt were found in young as well as in old plants of both nursery and field plantings. They consisted of a withering and browning of the lower leaves, dwarfing of the plant and of the foliage, and of an off-color grayish cast to the leaves prior to wilting. Some seedlings died before mid-summer in the nursery, and field plantings 2 or 3 years removed from the nursery showed all stages of wilting from earliest leaf symptoms to death of the plants. Seedling and field plants alike, when cut longitudinally through the stele, revealed a well developed brown vascular discoloration extending from the root system into the stems, branches, and petioles. Verticillium albo-atrum Reinke & Berth. was consistently recovered from such material, and there is no doubt that it is

the cause of the disease. Not infrequently plants were found affected with both Verticillium wilt and Phytophthora root rot.

Evidence that Verticillium wilt had been present for some years in older parts of the original Salinas nursery was found in the observation that many of the plants in some of these older beds were infected while little was found in newly established nursery beds. It is evident that seedlings infected in the nursery with Verticillium could be a source of considerable loss in field plantings where such infected plants are used. Furthermore, the susceptibility of guayule to Verticillium wilt makes field plantings on Verticillium infested soil (old cotton or tomato land, etc.) undesirable from the disease standpoint. The recovery of Verticillium from the bases of seed stalks in certain instances also raises the question of whether or not the fungus may be carried in the seed.

Collar rot. -- In addition to the crown or collar rot symptoms that may be associated with Phytophthora or Rhizoctonia root rots, there has been observed a collar rot that is apparently distinct. In this disease a blackish lesion affects the crown and sometimes the upper tap root resulting in a somewhat shredded condition of the infected tissue. A fungus tentatively diagnosed as a species of Phoma was most commonly recovered from the affected seedlings. The character of the rot and the frequency with which this organism was recovered from it suggest the likelihood that it may bear a causal relationship to the trouble.

Top rot. -- Of much greater importance was the outbreak at the end of July of a top rot caused by Sclerotinia sclerotiorum (Lib.) De Bary and S. minor Jagger. Although no signs of these fungi were found in June nor through most of July, the disease appeared in epidemic form in all of the Salinas nurseries following a cool, foggy period near the end of July and early August. Sclerotia of S. sclerotiorum were abundant on the soil about diseased plants, within stems of such plants, and apothecia were also plentiful on the moist soil. The crowded rows of well-watered beds and tender plants offered very favorable conditions for the development of both species of Sclerotinia. These fungi create an important problem during the final months the plants remain in the nursery, and in the packing and shipping of seedlings for field plantings. The same 2 species of Sclerotinia were found on diseased lettuce showing symptoms of drop in the same areas at the same time.

In August, a Botrytis rot of nursery plants appeared in the Salinas area, concurrently with the appearance of Sclerotinia. Older leaves on the lower part of the plant were most commonly affected, and these rapidly blighted and turned gray with sporulation. Sometimes the entire plant was affected and killed in a way resembling the top rot caused by Sclerotinia. Frequently Botrytis and Sclerotinia were both present in the same group of infected plants, in other cases they appeared independently of each other. This disease also was favored by the cool, wet weather and crowded tender condition of the nursery plants, under which circumstances it appeared to destroy as many plants in a given area as did the Sclerotinia species.

Leaf spot. -- From one of the nurseries were obtained leaves bearing definite, marginate leaf spots ranging in size up to 1/2 cm. in diameter. The spots were more or less circular, light-colored in the center and surrounded by a dark-brown border. The nature of the cause of these spots was not ascertained.

Root knot. -- In the older nursery beds at Salinas were found light infestations of the root-knot nematode, Heterodera marioni (Cornu) Goodey. Although no serious root-knot damage has been observed on guayule in California, occurrence of the trouble raises questions concerning the shipment and transplanting of infected seedlings, and the use for nursery sites of land infested with high populations of this nematode.

Summary

Several diseases have appeared in nursery and field plantings of guayule in California. Although pathogenicity tests of the organisms found associated with these diseases have not yet been performed, the constancy of association of certain fungi with certain diseases, points rather definitely to host-parasite relationships at least in those cases in which the fungi Phytophthora sp., Verticillium albo-atrum, Sclerotinia sclerotiorum, S. minor, Botrytis cinerea, and Rhizoctonia solani, respectively, are involved. It is [illegible] assumption that Pythium sp., and the fungus tentatively identified as a Phoma sp. may attack the plant also, under favorable conditions. Most of these fungi are favored by an environment distinctly on the wet side, and it is probable that they would be of little or no importance to guayule in its natural desert habitat. It seems clear that if the culture of guayule is to be maintained under wet growing conditions this plant will be continually subject to these and probably other plant parasites. Since guayule is now grown if transplanted from nursery beds to the field, these diseases take on added significance especially from the standpoint of introducing diseases into field plantings by means of seedlings infected in the nursery. These diseases are important also from the standpoint of placing healthy seedlings on land highly infested with pathogens of this plant, such as old lettuce land (Sclerotinia spp.), and old tomato and cotton land (Verticillium albo- trum), particularly in view of the fact that fertile agricultural lands, previously devoted to these other crops, are now being cropped to guayule. Furthermore, any consideration given to the prevention of these diseases must be into account the strictly seasonal development of certain of them, as illustrated by the Sclerotinia and Botrytis troubles.
(GUAYULE RESEARCH PROJECT, BUREAU OF PLANT INDUSTRY, U. S. DEPT. AGR., AND COLLEGE OF AGRICULTURE, UNIVERSITY OF CALIFORNIA.).

THE SUSCEPTIBILITY OF GUAYULE TO PHYMATOTRICHUM ROOT ROT

R. B. Streets

The projected planting of thousands of acres of guayule (Parthenium argentatum) to supply high grade natural rubber has drawn attention to possible limiting factors such as plant diseases which might limit rubber production. While experimental work on this desert shrub has begun about 1904, published information on its diseases is scant. Lloyd's critical

study[1] mentions only a rust and dodder. Taubenhaus and Ezekiel[2] list guayule as "moderately susceptible" to Phymatotrichum root rot.

As the irrigated lands of southern Arizona are more or less infested with the root-rot fungus, which spreads rapidly and causes serious damage, especially in susceptible perennial crops, the need of definite information on the susceptibility of guayule under irrigation was considered urgent. Through the courtesy of the U. S. Department of Agriculture we secured enough plants to set about one and one-half acres, approximately 10,000 plants. Two-thirds of Plot 1 (1/2 acre) previously planted to cotton was heavily infested by the root-rot fungus; 1/3 of Plot 2 previously planted to alfalfa was very heavily infested and the balance root-rot free.

The 1-year-old seedlings were planted April 17 and 18 and irrigated immediately. They received a light irrigation every 7 to 10 days for 6 weeks as the soil was a light sandy loam. Counts made 1 month later showed a survival of from 90 to 96% in the different borders (about 1/3 acre each).

By June 10, from 3 to 5% of the young plants, which had developed both new root and top growth, were dead and more were visibly injured. Examination of the root systems showed many elliptical areas from which cortical tissues had been removed. The large number of these injuries and their coalescence effectively girdled the tap roots, killing the plants. The belief that this injury was caused by insects was confirmed by Dr. L. P. Wehrle who determined that the injury was due to the feeding of the larvae (and possibly the adults) of a species of June beetle. No control measures were known and the loss of plants was very heavy throughout June. Some losses continued through the summer and a few plants were still dying in mid-September -- from injuries to the tap root received much earlier. Many of the survivors are stunted as a result of root injuries. On November 5, the stand in Plot 1 had been reduced to 14.2%, and Plot 2 was similar.

Dead and dying plants were examined at frequent intervals from early June to December, but strands of the root-rot fungus were found on only 1 plant which was also injured by June beetles. Probably infection was made possible by wounding of the root tissues. Eight of 10 small pistache trees in 1 border died of root rot during June, July, and August, while adjacent guayule showed no effect.

The results of one season's observations cannot, however, be considered conclusive for the following reasons: (1) the damage from June beetles resulting in the death of over 75% of the plants and more or less injury to the survivors; and (2) small plants may escape infection until their root system more fully occupies the soil, bringing them in contact with the root-rot fungus. Experiments in which these factors are controlled are now in progress in the greenhouse. From the limited data available it appears

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1/ Lloyd, F. E. Guayule: (Parthenium argentatum Gray) A rubber-plant of the Chihuahuan desert. Carnegie Institution of Washington. Publ. No. 139. 213 pp., illus. 1911.

2/ Taubenhaus, J. J. and W. T. Ezekiel. Texas Agr. Exp. Sta. Bul. 527. 1936.

that guayule showed only a trace of infection by root rot in the first year under irrigation, but until data on the second year are available the planting of guayule on irrigated lands known to be infected with root-rot is not recommended.
(UNIVERSITY OF ARIZONA, DECEMBER 8, 1942).

RELATION OF DOSAGE TO CONTROL OF COTTON SEEDLING DISEASES BY SEED TREATMENT

Richard Weindling

Cotton seed treatment has become a widely established practice in the cotton belt. Growers realize that more satisfactory stands of plants are obtained from treated seed than from untreated, particularly when spring-planting conditions are unfavorable and when seed is heavily infested with disease-producing organisms. Two organic mercury preparations have been recommended for dusting at the following rates per bushel of seed: 3 oz. for 2% ethyl mercuric chloride (sold as 2% Ceresan), and 1-1/2 oz. for 5% ethyl mercuric phosphate (sold as New Improved Ceresan).

Mercury is one of the metals essential for our war effort. It is highly desirable, therefore, to economize in the use of mercury compounds for seed treatment and to prepare for a possible shortage. Obviously, the problem is how to secure maximum benefits from whatever supplies may be available. An investigation has been started to determine the effectiveness of low dosages of mercurials in cotton seed treatment.[1/] The purpose of this note is to make available the information obtained so far.

Table I summarizes the results of 2 field tests planted in the spring of 1942 near Clemson, South Carolina. The seed was heavily infested with spores of the anthracnose fungus, Glomerella gossypii. Where beneficial effects with respect to stand and disease control were apparent, the lowest dosage (1/8 of that recommended) was about as effective as the highest one. Differences between dosages were not large enough to be statistically significant. The same seed lots gave similar results when planted in steamed soil in the greenhouse.

In the late spring and summer, further greenhouse work was carried on with treatments ranging as low as 1/32 of the recommended doses of the 2 mercurials. Some seed lots were infested with Glomerella gossypii, others with Phytomonas malvacearum [Xanthomonas]. One lot was reginned (machine-delinted) seed. Results of these greenhouse experiments were so nearly similar that they may be briefly presented as follows:

1. Dosage. With decreasing dosages, there was no reduction of effectiveness in disease control at 25% of the recommended doses, very small, if any, at 12.5%, and slight at 6.2%, but often a considerable reduction occurred at 3.1%.
2. Distribution. Coverage as affected by distribution of active material on seed was not an important factor under the conditions of these tests (small amounts of seed were treated in quart jars the day before planting). In some cases, however,

1/ In cooperation with the fungicide sub-committee of the War Emergency Committee, American Phytopathological Society.

Table I. Relation of dosage to control of seedling diseases of cotton by seed treatment.

Chemical a/	Dosage in oz. per bu.	Field 1		Field 2	
		Stand b/ 4 weeks after planting	Disease rating c/	Stand b/ 4 weeks after planting	Disease rating c/
Untreated	----	606	79.5	----	----
Filler	----	553	69.5	893	72.0
2% ethyl mercuric chloride	3.0	1023	42.0	1213	14.5
	1.5	1063	44.5	1153	17.5
	.75	997	44.5	1279	19.5
	.375	1066	46.5	1099	18.0
5% ethyl mercuric phosphate	1.5	1145	42.5	----	----
	.75	1198	45.0	----	----
	.375	981	49.0	----	----
	.188	1021	42.5	----	----

a/ Dusts for the lower dosages were prepared by mixing the chemicals with proportionate amounts of wheat flour so that seed could be treated at the rate of 3 oz. per bushel for the dilutions of the 2% material and 1-1/2 oz. for those of the 5% material.

b/ Based on plant counts of 4 50-foot rows per treatment randomized in 4 blocks.

c/ Based on 100 seedlings per treatment that were pulled at random; calculated by adding 1/2 the number of slightly lesioned to the number of severely lesioned seedlings. The disease rating of treated lots in field 1 was high due to extensive rhizoctonia injury.

lower dosages diluted with filler materials[2] were somewhat superior to those without filler.

These data indicate that the doses recommended for seed treatment of cotton may provide a wide margin of safety with respect to control of seed-borne pathogens. Lehman has previously suggested this by demonstrating the effect of vapors of New Improved Ceresan on some of these organisms.[3] With respect to soil-borne pathogenic fungi, such as Rhizoctonia solani and fusaria, several investigators have found that mercurials provide little protection.

The Seedling Disease Committee of the Cotton Disease Council is considering the suggestion that the dosage of mercurials used in treating cotton seed be reduced to 2/3 of the amounts previously recommended. Members of the committee evidently consider this dose as effective, on the basis of several years of experimentation under a variety of conditions throughout the cotton belt. Most of the work reported here was carried out under circumstances favorable for emergence and development of cotton seedlings. It will be necessary, of course, to demonstrate the effectiveness of low dosages under the various field conditions, before practical significance can be attached to the data.
(COTTON AND OTHER FIBER CROPS AND DISEASES).

DISEASE THREATENING BROOM CORN PRODUCTION IN ILLINOIS

Benjamin Koehler

Damage in 1942. A considerable number of broom-corn fields were very severely damaged by disease in the main broom-corn area of Illinois (Douglas and Coles Counties) and some damage was reported from adjoining Moultrie County. Severe damage was reported for the first time in 1941 and losses were even greater in 1942. Some farmers tried to salvage what they could. One grower, at Humboldt, for instance, harvested a field so badly diseased that he estimated he got only a 1/10 yield of marketable brush. The writer was informed that at least 10 fields were not harvested at all. Some growers declared that they were through with broom corn.

Symptoms of the Disease. Apparently the disease is a combination of leaf spotting, root rot, and stalk rot. As yet no early summer observations on the disease have been made by the writer, but apparently there is no serious seedling blight because the stands in the severely infected fields have been good. The root and stalk rot phase is most serious. First stages of this phase can often be seen at the junctions of the roots with the stalk at the crown. The roots, having their origin in tissues beneath the surface of the stalk, break the outer sclerenchyma making a weak place where infection can get started. As the tissues at the junctions of the roots

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2/ These preparations were kindly furnished by the DuPont Company.

3/ Phytopath. 31: 768. 1941.

with the stems become rotted the roots die.

After infection has entered the stalk it spreads rapidly through the vascular tissue, often going all the way up to the brush. The diseased areas turn red in color. The lower part of the stem soon becomes hollow and masses of the fungus mycelium can often be seen therein. Apparently infections may also start at the junction of the leaf sheaths with the stalks but these seem to be of secondary importance.

First sign of dying of the stalks is a blanching of the upper part. Sometimes this occurs before the brush emerges, or it may occur later. As the stalk dies it very often breaks over near the ground. By this time there are many reddish-brown discolored streaks or blotches on the surface of the stems, the larger blotches having gray centers. These apparently are not local infections that occurred from the surface, but are the result of the fungus coming to the surface from the interior. Spores are borne on these blotches. Similar blotches and spores appear on the leaves but these, no doubt, are the result of local infections.

Causal fungus. The disease appears to be caused by Colletotrichum graminicolum (C.e.) Wilson. At first it was hard to believe that this fungus is the real cause of the stalk rot because this same species has been observed to cause a leaf spotting on broom corn in Illinois for many years. The growers say that they never before have seen anything like the present epidemic of root and stalk rot. The varieties in use are the same as have been grown for 2 or 3 decades. Nevertheless, many isolations from the advancing margins of the visible infection in the stalks have consistently yielded this fungus. It may be a new strain or race. Occasionally the following fungi also were found: Cephalosporium acremonium, Fusarium spp., and Micrococcus species. These, however, are not considered the main cause. Close watch has been kept for symptoms of bacterial rot [Bacterium holcicola] which has been reported as causing serious damage to sorghum in some parts of the U. S. The writer is familiar with this disease on field corn and soybeans in Illinois, but nothing definitely resembling it has been observed on broom corn. The stalk rot in broom corn looks just like the stalk rot in sugar cane which is called red rot as pictured and described by Abbott (U. S. Dept. Agr. Tech. Bul. 641, 1938) and which is caused by a closely related, if not the same, species of Colletotrichum.

History of the Disease. Colletotrichum graminicolum causes anthracnose of a considerable number of cereal crops, including wheat, oats, rye, barley, corn, and sorghum. This does not necessarily mean, however, that the same strain of this species can attack all these crops, because some specialization is known to exist. Anthracnose of sorghum has been reported from nearly everywhere sorghum is grown the world over. Usually it is reported as a red leaf blotch of minor importance, but in some instances important losses have been reported as a leaf blotch and basal stem rot.

The Division of Mycology and Disease Survey, U. S. D. A., has in times past received reports of Colletotrichum attacking broom corn from Illinois, Louisiana, Mississippi, Tennessee, and West Virginia. Aside from this, only one reference to anthracnose of broom corn has been found by the

writer, so far. This is by R. J. Noble in the International Bulletin of Plant Protection (Vol. 9, pages 246-247. 1937). He mentions a severe root and stalk rot of broom millet caused by Colletotrichum in Australia. Presumably broom millet is their name for what we call broom corn, and he has put the emphasis on root and stalk rot rather than on leaf blotch, thus describing the condition we have been finding of late in Illinois.

Previous Cropping. None of the severely diseased fields examined had been cropped to broom corn the previous year. Whether the infection persists in the soil is not known. Spores are present in great abundance on dead leaves and stems of diseased plants and could be carried by the wind for considerable distances.

Soil Fertility. Soil samples were taken from severely diseased fields and analyzed for phosphorus, potassium, and p^H reaction by the division of soil survey analysis of the Agronomy Department. All but one of the fields tested very low in phosphorus. The exception was a very sick field of Black Spanish near Hindsboro. The test indicated that this field was high in available phosphorus. Potassium was adequate in all the fields and the p^H ranged from 5.2 to 6.7. Thus there is not much indication, so far, that phosphorus or potassium deficiency or p^H of the soil are very closely related to severity of the disease. As yet no data are available on the nitrogen relationships.

Varietal resistance. Black Spanish and White Italian are the principal varieties grown in the area. Black Spanish is the more susceptible, but some fields of White Italian were damaged so severely that they were not harvested. Scarborough Dwarf seems to resist stalk infection better than either of the others, but the leaves become severely spotted.

Resistant Selections. In a badly diseased field, not all plants are equally injured. In October on a farm at Humboldt, C. M. Woodworth and the writer attempted to make resistant selections in a portion of a badly diseased field of White Italian that had not been harvested. Heads were taken from about 200 of the best plants. Field tests must be made to determine whether any of these plants actually carry resistance. If resistance can be demonstrated it will constitute a method of control that can be extended to other varieties.

Experimental Results. A planting was made on the station farm, Urbana, with Black Spanish, White Italian, and Scarborough Dwarf. When the plants were about 4 inches tall, small pieces of the Colletotrichum culture, isolated from sick broom corn in 1941, were placed into contact with some of the roots beneath the soil surface, leaving uninoculated plots on each side of the inoculated ones to serve as controls. Later, leaf infection with Colletotrichum became severe in all varieties and in the control plots as well as in the inoculated ones. Stalk rot failed to develop in the controls and until late in September the inoculations seemed to have no effect. At that time some of the inoculated plants in the Black Spanish variety began to die and on October 12 when the final data were taken,

30% of the plants in the inoculated plots of this variety were broken down while all the control plants stood up.

Plans for Work in 1943. More extensive studies on inoculation methods are planned to be made on the station farm at Urbana. As the stalk rot phase of the disease failed to develop naturally in a serious way at the station farm, the tests of the selections for resistance, tests with fertilizers, and a more critical study of the development of the disease should be conducted in the broom corn area where the disease has been severe. These phases of the problem will be carried out as well as the war emergency permits.
(UNIVERSITY OF ILLINOIS, DEPARTMENT OF AGRONOMY, URBANA).

PARASITIC FUNGI COLLECTED ON CERTAIN FORAGE LEGUMES IN THE PACIFIC NORTHWEST IN 1941

John R. Hardison

This report is based on material collected in several northwestern States, viz., Washington, Oregon, Idaho, Montana, and Wyoming. Vetches, especially Vicia villosa Roth., in the Soil Conservation Service nurseries at Pullman, Washington, were seriously defoliated by a combination of Ascochyta pisi Lib. and Ovularia schwerziana Magn. Ovularia appeared to be chiefly responsible and reached epiphytotic proportions by midsummer. The Septoria scalds of vetch reported by Sprague[1] as occurring in Oregon were not observed; however, the writer did not collect in western Oregon or Washington. Recently downy mildew of vetch in Oregon has become increasingly severe and threatens to be the most serious vetch disease in that area[2]. The rusts of Lupinus and Medicago generally occurred sporadically although they were serious on some plants in the nursery at Pullman. Uromyces glycyrrhizae (Rab.) Magn. on Glycyrrhiza lepidota (Nutt.) Pursh. was very serious in some parts of the Yakima Valley, Washington, where the plant is often a troublesome weed.

The writer is indebted to Dr. George W. Fischer, whom the writer accompanied on an extensive grass disease survey, for the opportunity to collect forage legume diseases. Thanks are also due to Mr. John L. Schendiman for checking the identity of the legumes collected in the Soil Conservation Service nurseries at Pullman, and to Dr. Roderick Sprague and Dr. F. R. Jones for assistance in determining several of the Fungi Imperfecti.

1/ Phytopath. 30 (6): 541-542. 1940.

2/ From conversation with C. E. Owens and Harry Shoth at Corvallis, Oregon, July 1942.

ASTRAGALUS FALCATUS Lam.

Powdery mildew, Erysiphe polygoni DC., S. C. S. nursery, Pullman, Wash.
Leaf spot, Macrosporium sp.

ASTRAGALUS MELILOTOIDES Pall.

Downy mildew, Peronospora sp.; S. C. S. nursery, Pullman, Wash.

ASTRAGALUS MORTONI Nutt.

Powdery mildew, Erysiphe polygoni DC.; S. C. S. nursery, Pullman, Wash. Some collections contained the mildew parasite, Cicinnobolus cesatii DBy.

ASTRAGALUS sp.

Leaf spot, Septoria sp.; Boulder River, Mont.

CROTALARIA SAGITTALIS L.

Leaf spot, Phoma sp.: Range north of Butte, Mont.

GLYCYRRHIZA LEPIDOTA (Nutt.) Pursh.

Rust, Uromyces glycyrrhizae (Rab.) Magn.: Yakima, Wash.

LATHYRUS MARITIMUS (L.) Bigel

Stem and pod spot, Ascochyta lathyri Trail.: S. C. S. nursery, Pullman, Wash.

LUPINUS PERENNIS L.

Leaf spot, Cylindrosporium sp.: Ranchester, Wyo.
Leaf spot, Septoria lupinicola Dearn.: 5 miles south of south entrance to Yellowstone Park, Wyo.

LUPINUS RUBRICAULIS Greene

Powdery mildew, Erysiphe polygoni DC.: S. C. S. nursery, Pullman, Wash.

MEDICAGO LUPULINA L.

Rust, Uromyces striatus Schroet.: Yakima, Wash.

MELILOTUS ALBA Desr.

Leaf spot, Stemphylium sarciniaeforme (Cav.) Wiltshire: Naches River, Wash.
Leaf spot, Stagonospora meliloti (Lasch) Petr.: 4 miles north of Viola, Idaho.

MELILOTUS OFFICINALIS (L.) Lam.

Downy mildew, Peronospora sp.: Viola, Idaho.
Stem canker, Ascochyta caulicola Laub.: Flathead Lake, Mont.

PENTSTEMON NEPALENSIS (Hook.) Sweet

Leaf spot, Ascochyta pinodella L. K. Jones: S. C. S. nursery, Pullman, Wash.

TRIFOLIUM FRAGIFERUM L.

Leaf spot, Pseudopeziza trifolii (Rostr.) Petr.: S. C. S. nursery, Pullman, Wash.

TRIFOLIUM HYBRIDUM L.

Leaf spot, Stagonospora meliloti (Lasch) Petr.: S. C. S. nursery, Pullman, Wash.; and 4 miles north of Viola, Idaho.
Powdery mildew, Erysiphe polygoni DC.: S. C. S. nursery, Pullman, Wash.
Scorch, Colletotrichum trifolii Bain.: Viola, Idaho; Salem, Oreg.; and Yakima and Pullman, Wash.

TRIFOLIUM PRATENSE L.

Leaf spot, Pseudopeziza sp.: Corvallis, Oreg. (collected July 1942)
Powdery mildew, Erysiphe polygoni DC.: Viola, Idaho; S. C. S. nursery, Pullman, Wash.
Rust, Uromyces trifolii (Hedw. f.) Lév.: Yakima, Wash.; Viola, Idaho.
Scorch, Colletotrichum trifolii Bain.: Athol, Idaho.

TRIFOLIUM PROCUMBENS L.

Powdery mildew, Erysiphe polygoni DC.: S. C. S. nursery, Pullman, Wash.

TRIFOLIUM REPENS L.

Leaf spot, Pseudopeziza trifolii (Rostr.) Petr.: S. C. S. nursery, Pullman, Wash.

WEATHER CYCLES AND FRUIT DISEASES AT HOOD RIVER, OREGON

J. R. Kienholz

A study of annual growth rings of forest trees was reported by Griswold (4) for the Lewis River country of Washington, which is some 30-40 airline miles from Hood River, Oregon. The data he presented showed a complete rainfall cycle to occur at approximately 95-year intervals in this general region. This means we can normally expect periods of about 40 to 50 years each when the average rainfall will either be increasing toward a peak, or decreasing toward a minimum.

The annual precipitation record at Hood River (figure 1) appears to follow this cyclic pattern rather closely. A peak rainfall of 54.17 inches was recorded in 1893 and a minimum of 16.55 in 1935. This 42-year period of decreasing rainfall corresponds closely to the theoretically expected dry cycle. A trend toward increased rainfall has occurred since 1935, which should again reach a peak by approximately 1985. Minor 10- and 20-year cycles of fluctuating rainfall mentioned by Griswold (4) may be visually approximated in figure 1.

It would be interesting to determine what correlation there may be between the severity of certain fruit diseases and these weather cycles. Long-time records, of course, are not available for most fruit diseases, since the fruit industry is still too young in the Hood River Valley for such history. However, some records are available, and these together with more recent observations may serve as a basis for some interesting speculations.

1. Apple scab: Venturia inaequalis (Cke.) Aderh. Apple scab was limited to a few orchards in the Hood River Valley in 1905 (3). A period of serious commercial loss occurred from about 1910 to 1917 due to an increase and spread of the pathogen and to the fact that ineffective sprays were being applied at the start of the period. This apple scab period coincides with a 10-year period from 1911 to 1921 in which the average rainfall was above normal.

Apple scab suddenly decreased in 1917 and since then has not required a special spray program up to the present time. The introduction of lime sulfur (3) and more effective spray schedules (1) toward the end of the period of scab severity should be given due credit for this virtual disappearance of scab. An 11-year period of below-average rainfall occurred, however, between 1921 and 1932, which probably contributed strongly to holding scab infections at low levels. May and June rainfall in particular decreased sharply from 1917 to 1932, a fact probably deserving major credit for the sudden decrease in apple scab.

Oil sprays replaced lime sulfur as a dormant spray for apples about the time apple scab became a minor problem. They have been in constant use ever since. Only occasional scabby apples were noticed in orchards up to 1939, but a gradual increase occurred to 1940. A decided increase in scab infections was noticed during the past 2 seasons so that an estimated 2 to 3% of the apple crop was lost from the disease in 1942. Individual orchards produced as much as 10% scabby fruit. The scab fungus is again generally distributed throughout the district. Since the application of

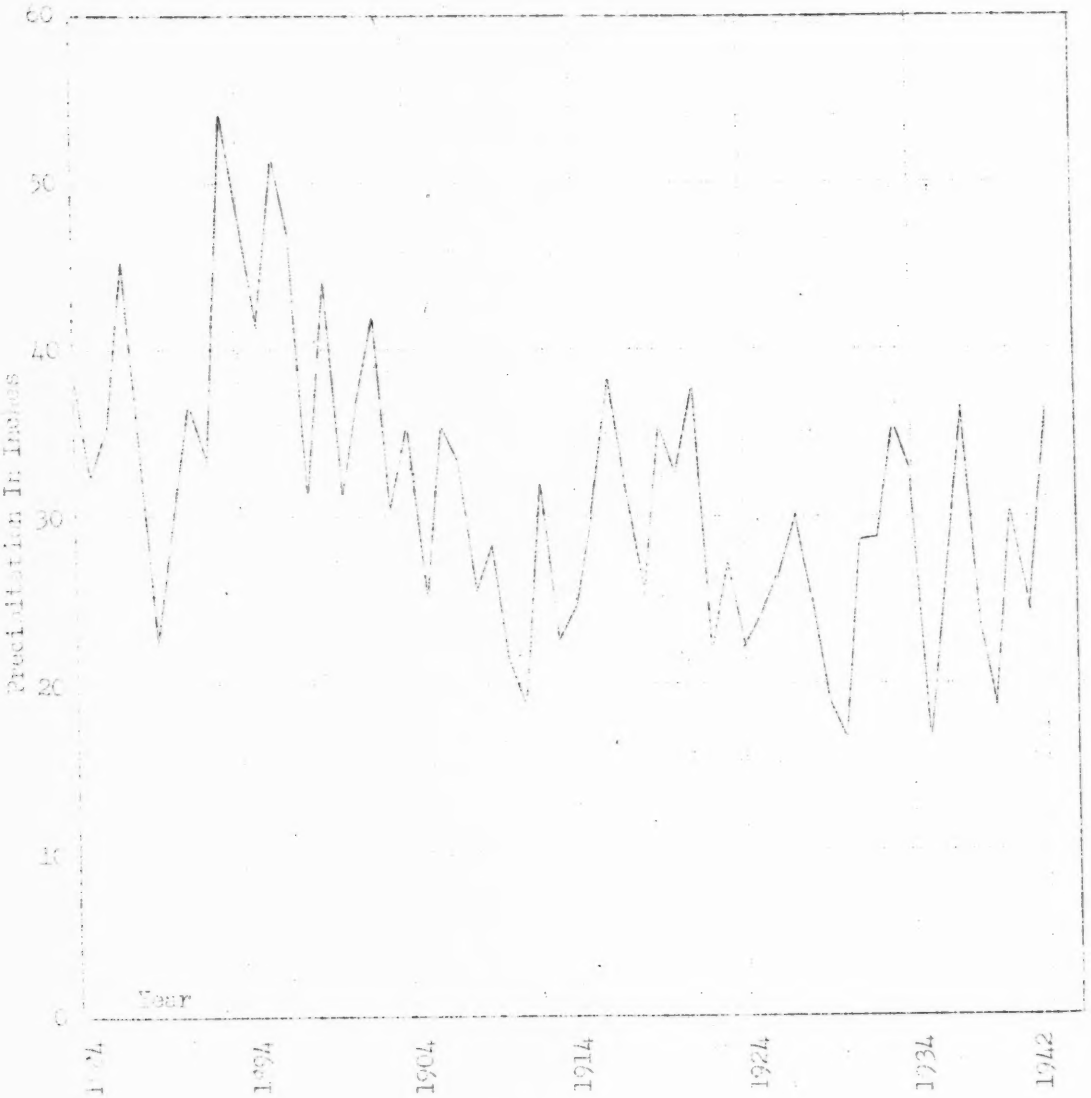

Figure 1. Precipitation Record - Hood River, Oregon

sulfur over dormant oil sprays may sometimes cause injury, it may become necessary to revive the use of lime sulfur as a dormant spray so that an effective scab control program can be employed during the growing season. It will be interesting to observe the performance of apple scab at Hood River in relation to the expected wet cycle of coming years.

2. Pear scab: Venturia pyrina Aderh. Pear scab has been observed at Hood River nearly as long as apple scab. The constant use of lime sulfur as a dormant spray, followed by wettable sulfurs later for mildew control, no doubt was the main factor in keeping pear scab suppressed during earlier years. Large plantings of pear trees replaced apples after the severe freeze of 1919, so that apple and pear trees are now about equal in number.

Commercial losses from pear scab began to occur about 1932, but these were largely limited to 3 restricted areas and to what could be classed as submarginal orchards. The ability of the pathogen to overwinter extensively in young twigs (6) makes these twig cankers persistent sources of infection each spring. Rapid scab increases may be expected because of this fact, although sudden decreases may result from weather conditions. A notable example of such a decrease occurred in 1935. Twig infections were sufficiently numerous to favor heavy primary spring infections, but only 0.77 inch of rainfall was recorded for the 5 months from May to October. Pear scab was a minor problem in 1936 because of this decreased primary infection, but sufficient overwintering twig pustules were produced to furnish a few primary infections in 1937. Favorable scab weather that spring caused numerous secondary infections. A noticeable general increase resulted during the seasons 1941 and 1942, so that the fungus is now established in all sections of the Valley.

Langford and Keitt (7) have shown that a strain of the fungus attacking Anjou pears does not produce noticeable infections on Bartlett. Such strain difference is apparent in orchards at Hood River. In the Lower Valley, the Anjou, Easter, Winter Nelis, Flemish Beauty, Forelle, and Bosc varieties are frequently heavily infected, but Bartlett in the same orchards remains quite free from infection. In the Upper Valley, a strain of the fungus severely attacking Bartlett appeared in 1940, but failed to infect Anjou to any extent in the same orchards.

The greater concentration of pear orchards and general distribution of the pathogen during the past 2 seasons create an important problem. The prospective shortage of labor and lack of certain fungicides will be a more serious matter for the pear grower if there is increased rainfall at scab infection time during the next few years.

3. Brown rot of stone fruits: Monilinia spp. Brown rot is present on various stone fruits each year at Hood River but has rarely caused material losses. A high percentage of rotted fruit was observed on unpicked sour cherries during the late summer of 1940. A small commercial loss of sweet cherry fruits was experienced in the district in 1941, when cracked fruits became infected. Heavy losses to the sweet cherry crop occurred in 1942, due to split fruits resulting from a rainy harvest season. Approximately 5% of the cherries delivered to packers were discarded because of brown rot. A high percentage of the cherries ordinarily shipped in the fresh condition were diverted to canneries to avoid further losses in transit. Individual orchards produced more than 20% rotted fruits and several with higher percentages of rotted fruits were left unpicked.

Brown-rot fungi were isolated consistently from killed twigs of sour cherry at Hood River, and of apricot at both Hood River and The Dalles, Oregon, during the season. Fungous troubles of this type are rarely encountered at the latter place because of low rainfall averages. Apricot and Italian prune fruits in local orchards yielded as high as 50% infected fruits at harvest. The cultural characters of practically all isolations made from infected fruits and twigs of these stone fruits corresponded to those of Monilinia laxa (Aderh. & Ruhl.) Honey (5). The species M. fructicola (Wint.) Honey was only infrequently isolated.

4. Leaf spot of cultivated and wild cherries: Coccomyces spp. Previous to 1942 Coccomyces hiemalis Higg. had not been observed on cherry leaves at Hood River, although it is a common parasite in western Oregon. Five collections of the cherry leaf spot were made during 1942 from several orchards. A definite point of primary origin was not found, which indicates perhaps that infections resulted from spores carried by the wind for some distance.

A leaf spot of bin cherry, Prunus emarginata, also made its appearance during 1942. Trees of this native cherry have frequently been examined in past years without finding leaf spot. Previous reports of the disease for this host appear to be lacking. It is presumed the pathogen is Coccomyces lutescens Hig.

Cylindrosporium puttemansii (Harkn.) Desern. (= ? C. lutescens Hig.) on Prunus virginiana var. demissa was collected during 1936, but appears to have remained localized up to the present time.

Local cross-inoculation studies with these 3 fungi have not been made, but might be desirable since the first 2 species appeared simultaneously in this district. Specimens of the fungi have been sent to the Mycological Collections of the Bureau of Plant Industry, Beltsville, Maryland.

All of the diseases listed so far appear to be dependent primarily upon moisture factors for their increased severity. Two other diseases previously extremely important in the Hood River Valley, which are dependent upon other climatic influences, are discussed in following paragraphs.

5. Perennial canker of apple trees: Neofabraea perennans (Zeller & Childs) Kienholz. The destructive nature of perennial canker is related to low winter temperature injuries to apple trees. Up to about 1932, the woolly aphis was an abundant insect on apple trees of the district, causing numerous tender galls to form on callus growth by its manner of feeding. These galls ruptured when temperatures fell much below 0°F., and became infection portals for the pathogen. The succession of injury and infection from year to year caused annual extension of the cankers. With the introduction of the woolly aphis parasite (2), the aphis has been naturally controlled during the past 10 years and now perennial canker infections have been comparatively rare. Until temperatures occur that are severe enough to injure the more hardy tree tissues, the parasite should continue the indirect control of the disease on apple trees by holding the woolly aphis in check.

6. Apple tree canker: Neofabraea malicorticis (Cordley) Jackson. Under natural conditions this canker fungus is favored by high autumn rainfall. Since it is easily controlled by copper fungicides, its reappearance in orchards is largely due to lack of adequate spraying. The apple

tree cankers have ceased to cause serious losses at Hood River except for occasional girdling of young trees, particularly those interplanted in old orchards where proper spraying has not been practiced.

The fruit rots caused by these 2 canker fungi continue to result in frequent serious commercial losses. High rainfall previous to harvest favors fruit infections.

Discussion

The examples of increased losses from fungous diseases during recent years at Hood River appear to be related to higher spring rainfall. A comparison of the average rainfall for the months of May and June is of particular interest. The years 1917 to 1935 form a period of decreased activity by fungi dependent upon high rainfall conditions. The end of this period corresponds with the minimum precipitation record of what is apparently a dry cycle. The average rainfall during this period for the months of May and June was 0.74 and 0.41 inches, respectively. The averages for the same months from 1936 through 1942 were 1.28 and 1.11 inches, which with the similar trends in annual precipitation, tend to support the idea that a wet cycle is in the making.

Accurate records are not available, but it is worth mentioning that deficiency and "physiological" diseases came into prominence during the apparently dry-cycle years. Of the former troubles, zinc and boron deficiencies have been commercially important in Oregon.

Because of the comparative newness of our knowledge of virus diseases, their known history is rather modern. It is entirely possible, however, that weather cycles might influence their appearance or severity to a great degree; either by effects on the virus itself, or upon insect vectors which might be responsible for transmission.

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(DIVISION OF FRUIT AND VEGETABLE CROPS AND DISEASES, BUREAU OF PLANT INDUSTRY, U. S. DEPARTMENT OF AGRICULTURE, HOOD RIVER, OREGON).

FRUIT DISEASES IN IDAHO IN 1942

Earle C. Blodgett

The following list of fruit diseases has been compiled from the records of inquiries and of field observations on the occurrence and prevalence of these diseases during 1942. Most of the notes were made during field trips of June 8-24, August 16-21, and September 14-22. These trips were not strictly of a survey nature and the following records were taken incidental to other work. Thus the list is complete only in that it includes all diseases observed in 1942. The report is similar to those for 1936 to 1941.

Parasitic Diseases

1. Coryneum blight (Coryneum beijerinckii Oud.) [Coryneum carpophilum] of peach was common but less severe this year. Twig cankering and fruit spotting caused considerable damage however in orchards where suitable spray programs have not been followed. (March - September.)

2. Coryneum blight of apricot was very severe near Moscow and in the Lewiston area where some fruit was not used because of the injury.

3. Coryneum blight of sweet and sour cherry was responsible for considerable loss in certain orchards at Lewiston where spraying has been neglected.

4. Coryneum blight was severe on unsprayed Italian prune at Moscow and was noted on date prune at Payette.

5. Powdery mildew (Podosphaera spp.) of Jonathan apple was fairly common on foliage and young terminal shoots.

6. Powdery mildew (Sphaerotheca mors-uvae (Schw.) Berk. & Curt.) of gooseberry and red currant was very severe on unsprayed plants at Moscow.

7. Powdery mildew (S. pannosa (Wallr.) Lév.) on peach was widespread but not serious. It was reported in some orchards for the first time this year.

8. Fire blight (Erwinia amylovora (Burr.) Winslow) on pears was very severe. The outbreak due to artificial inoculation in plots at Moscow killed many young trees.

9. Fire blight of Jonathan apple, mostly in the form of sour blight, was worse than usual. In some orchards the disease limited production of certain trees where infected pear trees were near by.

10. Perennial canker (Neofabraea perennans (Zeller & Childs) Kienholz) was noted on Rome Beauty and seedling fruits at Moscow. (Storage season).

11. Leaf curl (Taphrina deformans (Berk.) Tul.) of peach was again extremely severe on unsprayed trees in northern Idaho and caused considerable leaf fall in unsprayed orchards of southern Idaho.

12. Leaf spot, cane canker, and die back (Septoria spp. and Glomerella cingulata (Sten.) Spauld. & Schrenk.) of brambles (youngberry, boysenberry) was much less noticeable this year than usual.

13. Currant anthracnose (Pseudopeziza ribis Kleb.) caused almost complete defoliation of red currant plants early in the season on the plots at Moscow. Strangely enough, gooseberry plants near by were barely affected. It was also noted as severe at Kooskia. It should be recorded that good development of apothecia was found on overwintered current leaves in April. So far as is known the only other collection in the United States of the perfect stage of this fungus was reported from Wisconsin by the writer (Phytopath.: 26: 115-142. 1936).

14. Strawberry leaf spot (Mycosphaerella fragariae (Tul.) Lindau) was common and quite serious in many plantings in northern Idaho.

15. Strawberry leaf scorch (Diplocarpon earliana (Ell. & Ev.) Wolf) was noted in one patch.

16. Blue mold rot (Penicillium expansum) was common on many hosts, including cherry, apple, pear, and prune. (Storage and shipping seasons).

17. Black mold rot (Rhizopus nigricans Ehr.) was again observed commonly on peaches and affected prunes and apples to some extent. Rot of strawberries was common.

18. Botrytis rot (Botrytis sp.) was noted on strawberries.

19. Apple scab (Venturia inaequalis (Cke.) Wint.) was generally present in northern Idaho. An interesting case of almost 100% infection of Rome Beauty fruit occurred at Moscow on a single tree. No trace of scab had been noted on this tree during the last 6 years and no control measures had been used. Leaf infection and defoliation also were very severe.

20. Brown rot (Sclerotinia sp.) [Monilinia] was abundant locally in certain sweet cherry orchards at Lewiston and on wild plum at Post Falls.

Non-Parasitic Diseases

1. Winter injury was responsible for considerable fruit bud killing of peach in northern Idaho. The minimum temperature recorded at Moscow was -15°F. The disease noted in 1941 and tentatively reported as bacterial gummosis may be due primarily to winter injury on sweet cherry and apricot. So many complicated factors are involved, however, that at present only the serious losses of young trees are obvious and the causal factors remain to be determined.

2. Drought spot of prune was noted in scattered cases.

3. Cracking of sweet cherries was common in the Lewiston area but the amount of injury was less than anticipated.

4. Lime-induced chlorosis continued to be a very serious factor in many orchards and small fruit plantings in southern Idaho.

5. Spray injury was not serious this year although some damage to peach and apple by arsenicals was noted.

6. Systemic arsenic toxicity (injury to trees caused by arsenical residues on old apple land) of peach was observed as usual but damage was less severe this year.

7. Blackmore yellows [genetic] was reported on strawberry plants at Potlatch.

8. Rosette of apples apparently is causing more damage than usual judging by the inquiries received and interest in diagnosis.

Virus Diseases

1. Raspberry mosaic (types not separated) was as serious as usual.

2. Cherry mottle leaf was observed in scattered orchards.

3. Peach mottle was present in the original tree at Emmett. The similar mottling on several trees in other orchards (in one case wart and mottle on the same tree) was shown by budding tests to be transmissible. This apparent recent and rapid spread may be significant.

4. Peach wart was noted in several orchards but symptoms appeared to be less striking this year.

5. The Western X-disease in some orchards this year showed very striking symptoms and mapping indicated a spread and increased intensity of disease. In one orchard some trees known to have been infected and in other orchards several trees which exhibited characteristic symptoms the last year or two did not show even traces of the disease as late as September 15 this year. There were therefore indications that trees might have recovered, at least temporarily.

6. A peculiar disease of sweet cherry found in Idaho first in 1940 has been shown to be transmissible to Bing, Mazzard seedlings, and Montmorency cherry. This disease is regarded as the same as reported in Colorado as rosp leaf and in British Columbia as leaf crinkle.

7. A leaf variegation of peach similar in some respects to calico as noted last year (and reported as another case) has been shown to be transmissible. Some of the leaves and shoots of affected trees are devoid of chlorophyll and appear yellowish white.

Miscellaneous Diseases - Causes Undetermined

1. Italian Prune. (a) -- Leaf curl was especially prevalent this year. There is indication that not all the damage is due to the presence of mite pests. (b) -- Leaf spot was noted as usual this year. Affected trees or budded branches continue to show severe leaf spot and defoliation. In one nursery shipment of 39 Italian prune trees, 5 developed severe leaf spot symptoms and tree growth was stunted. (c) -- The chlorosis and malformation of prune foliage in the orchard near Weiser showed some apparent recovery when zinc sprays were applied in early spring. (d) -- The leaf deformity of Italian prune (2 trees) at Fruitland is now known to be bud transmitted. (e) -- Several Italian prune trees in one orchard were noted that leaf out late, bear small crops, and shed their leaves very early. Study of this condition is now under way.

2. Apricot. (a) -- The trouble noted at Weiser apparently responded to zinc sprays. (b) -- The development of cankers on trunks and main limbs of apricots has been noted commonly this year. About 75% of the trees in one young orchard at Emmett have died during the past 2 years. This may be winter injury. (c) -- So-called physiological spotting of apricot fruit was noted as usual. (d) -- Internal discoloration and rotting of the fruit tissue around the pit before the fruit is ripe has been reported on one tree near Fruitland.

3. Cherry. (a) -- The cherry rosette trouble near Weiser seemed to respond to zinc treatments. (b) -- The red leaf of chokecherry is widespread although it seems to be associated with the Western X disease of peaches, many budding tests to peach have failed to show transmission. Affected chokecherry trees appear to lose vigor quite rapidly.

(c) -- Loss of young trees in many widely scattered orchards was serious again this year. Winter injury may be the primary cause. (d) -- In one orchard at Emmett several old, mature sweet cherry trees died outright during the summer. High water table was suspected but test holes showed that this theory was probably wrong. (e) -- Sour cherry trees in at least 3 locations exhibited symptoms of what is regarded as similar to cherry yellows. The leaf symptoms and defoliation appeared typical. (f) -- Several mature sweet cherry trees at Twin Falls showed extensive development of large cankers on limbs throughout the tree. Excessive swellings and gumming accompanied the cankers and tree vigor was markedly reduced. No similar trouble has been seen before and tests are under way to determine the cause. (g) -- The complex involving sweet cherry crinkle, deep suture, lace leaf, and leaf necrosis is still under study.

4. Peach. ( ) -- Calico. In 1941 what was considered a new case of this disease was noted but the results of budding tests 1941-42 indicated that it was transmissible. (See virus diseases.) The original tree noted in 1939-40 represents what is generally considered a chimera and is bud perpetuated but with some difficulty. (b) -- Rough bark continues to be of considerable concern in the orchards where noted but the cause of the disease is unknown. (c) -- The condition noted in 1941 and called bark splitting was very common this year but no more is known regarding cause. (d) -- Rusty spot symptoms were very mild in the Caldwell orchard and also less severe in the Moss orchard. (e) -- A new type of leaf symptom has been noted on young trees at Kooskia.

5. Gooseberry. Leaf symptoms suggestive of a mosaic were seen on plants sent in from St. Anthony.

6. Strawberry. Severe loss of plants in one garden at Twin Falls was noted in June. The root killing was probably due to a combination of high heading soil and root rot fungi.

The 1942 season was characterized by a rather cool, wet spring but rainfall during the summer and fall was about normal so that parasitic diseases were not so outstanding as they were last year.
(IDAHO AGRICULTURAL EXPERIMENT STATION, MOSCOW).

BRIEF NOTES ON PLANT DISEASES

SOYBEAN STREAK IN OHIO: While making a survey of the diseases of soybeans in central Ohio during the summer of 1942, a destructive virus disease was observed in Franklin, Fairfield, and Pickaway counties. The disease was found in several commercial fields as well as in the University experimental plots. Only a small percentage of plants in any field were infected; those were more numerous near the fences and adjacent roadways. Diseased plants were characterized by a bronzing of the foliage and the growing stem-tips were brittle and showed numerous, small,

necrotic streaks. Infected plants were considerably stunted when compared with adjacent healthy plants of the same age and a severe reduction of the number of pods was also observed. Inoculations with expressed juice from diseased plants to young healthy seedlings in the greenhouse produced faint mosaic 7 days after inoculation followed by a necrosis of the growing-tips resulting in death of the infected plants. Inoculations to cowpea and Turkish tobacco indicates this virus belongs to the group of tobacco-ringspot viruses. Should the disease become well established in the soybean growing areas a crop loss of considerable proportions may be expected. A more detailed study is in progress. (Folke Johnson, Department of Botany, Ohio State University).

POWDERY MILDEW OF SAINTPAULIA IONANTHA WENDL.: On December 2, 1941 several specimens of African violet (Saintpaulia ionantha Wendl.) showing definite leaf infection with a powdery mildew were received from a commercial florist located near Elmira, N. Y. This florist had, in turn, obtained his young plants from another New York State florist who, about 2 years earlier, had told the writer of seeing a powdery mildew on some of his plants, though inspection of the range at that time had failed to reveal any infection. Several specimens of African violet infected with mildew were submitted by a florist of Watervliet, N. Y. again on March 18, 1942 and a serious outbreak of mildew also occurred on African violets in the Floriculture greenhouses at Cornell University, Ithaca, N. Y. in November 1942. The latter infection was quickly eradicated by spraying with Fungisul (a colloidal sulfur spray) at a concentration of 1-1/2 lbs. per 100 gals., with no injury or noticeable discoloration of the plants.

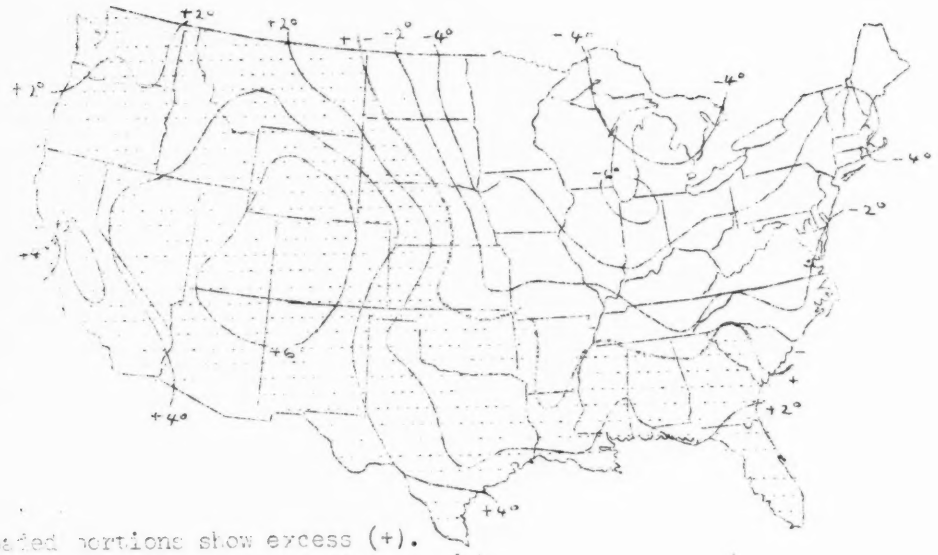
The writer has been unable to find any other report of powdery mildew on Saintpaulia ionantha either in this country or abroad. No peritheciа were found on any of the specimens examined, nor was any evidence obtained as to whether the Oidium sp. involved is or is not specific to S. ionantha. (A. W. Dimock, Department of Plant Pathology, Ithaca, New York).

WEATHER OF DECEMBER AND OF THE YEAR 1942

(From U. S. Department of Commerce, Weekly Weather and Crop Bulletin for weeks ending January 5 and January 12, 1943.)

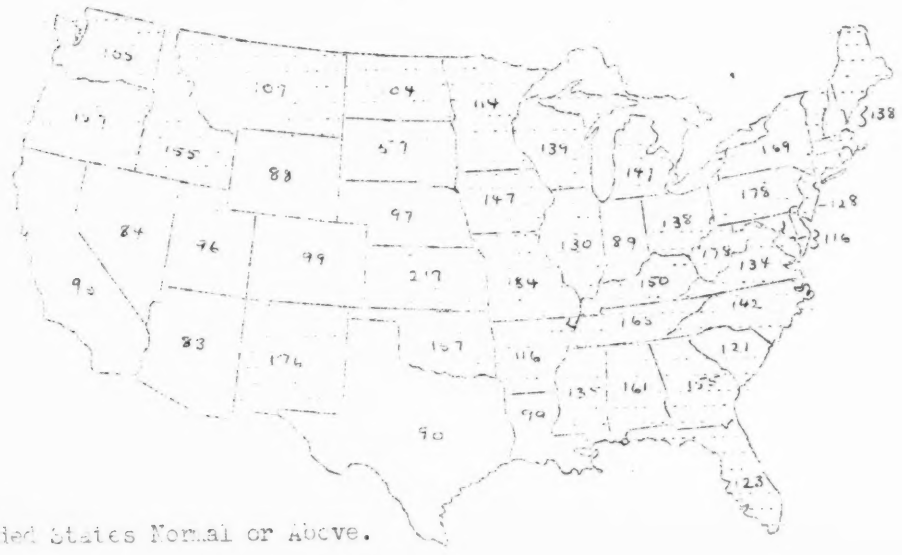
DECEMBER WEATHER: Fig. 1 shows the departure of the mean monthly temperatures from normal for December 1942. In central and northern States from the eastern Great Plains eastward the month was colder than normal, with the greatest anomalies in the extreme Northeast, the eastern and lower Lake region, and the northern Ohio and upper Mississippi Valleys. In these areas the temperature averaged from 4° to 6° below normal. On the other hand, in the southern States south of North Carolina, Tennessee, southern Missouri, and southern Kansas the monthly means ranged from approximately normal to 1° or 2° above normal. From the central Great Plains westward temperatures were abnormally high, with the greatest plus departures in central Rocky Mountains and eastern Great Basin sections.

Fig. 2 shows the percentage of normal precipitation, by states, for December.



Shaded portions show excess (+).
Unshaded portions show deficiency (-).
Lines show amount of excess or deficiency.

Fig. 1. Departure of Mean Temperature from the Normal, December, 1942



Shaded States Normal or Above.

Fig. 2. Percentage of Normal Precipitation, by States, December, 1942

Shaded portions show excess (+).
Unshaded portions show deficiency (-).
Lines show amount of excess or deficiency.

Fig. 3. Departure of Mean Temperature from the Normal, Year, 1942

Shaded States Normal or Above.

Fig. 4. Percentage of Normal Precipitation, by States, Year, 1942

THE WEATHER OF 1942: On the whole, the winter of 1941-42 was warmer than normal, although in much of the South, locally in the Northeast, and in most Rocky Mountain and Great Basin sections the temperature averaged below normal. The outstanding feature of the winter was a prolonged period of unusual warmth, embracing largely the last half of January and the first half of February, with severe wintry conditions immediately preceding and following. The lowest temperature reported in January was -48° at West Yellowstone, Mont., and in February -52° at Taylor Park, Mont. The lowest reported for Alaska was -58° at Ft. Yukon.

The spring had mostly favorable weather for agriculture, except that drought conditions developed in the more eastern States, which, however, were relieved by good rains the latter part of May; subsequent showers furnished sufficient moisture for crop needs. Most of the principal agricultural areas of the country had from near-normal to above-normal rainfall and temperatures were largely favorable. Consequently, crops entered the summer with good prospects, although in some northern States spring plantings, especially of corn, were delayed considerably by rains and wet fields.

On the whole, the summer of 1942 was characterized by unusually favorable weather for the development of crops. This season was noteworthy for the persistence of near-normal temperatures with practically all sections having seasonal means within 2° of normal. All States east of the Rocky Mountains, except Nebraska, Minnesota, and Florida, had above-normal rainfall, in marked contrast to the several dry years in the 1930 decade. With favorable temperature and moisture conditions crops made phenomenal development and at the end of the summer record yields were practically assured. The highest temperature for the summer was 126° at Cow Creek, Calif.

The fall months had too much rain in some interior, eastern, and far western States, and unfavorable dryness in much of the South. The most adverse weather feature of the year was the early frosts and freezing weather in the Interior and Central-Northern States which resulted in more or less damage to all the crops that had not matured. The bulk of corn had developed beyond the susceptible stage, but a good many late fields were affected rather extensively, resulting in considerable soft corn. The most outstanding crop was that raised by late truck and garden crops, and more extensively to soybeans. Fortunately, following the freeze the weather was ideal for drying out the crops that were frosted so that the actual loss was reduced from that at first appeared. Otherwise, fall weather was generally favorable.

Fig. 3 shows that temperatures for the year as a whole averaged above normal in most sections of the country, in keeping with a good many years immediately preceding. Much of the South and a small northwestern area had annual means slightly below normal, but all other sections, except very locally, had above-normal warmth though the anomalies were relatively small.

Fig. 4 shows the percentage of normal precipitation by States for the entire year, based on practically all reporting stations. The year was characterized by unusually abundant precipitation, with 9 of the 12 months, in general, having above normal, while every month from March to December, except July, had more than the normal amount. The annual average for the